Dynamic error fields derivation by inverting a validated interpretative perturbations model

I.G. Miron and JET Contributors*

National Institute for Lasers, Plasma and Radiation Physics, Magurele-Bucharest, Romania

A dynamic perturbations model has been already tested and validated during different discharges at JET [1]. A good match between our calculated perturbations amplitude and frequency and the ones provided by the JET Python code data analysis has been found. In order to obtain our results a presumed very low static error field spectrum has been parametrically used to better match as accurate as possible the perturbations experimental results. This time we intend to perform an inverse approach of our model, starting from the already checked approximate overlap between the calculated and the measured perturbations quantities in order to derive the amplitude of the magnetic error fields influencing the perturbations behavior, the latter playing the role of the input data. Our entire model being dynamic, the expected error fields to be derived are also dynamic. The error field modes are to be introduced into the perturbations differential system of equations in the whole space (plasma, vacuum and plasma column external structures) and searched for as unknowns, whereas the plasma modes of perturbations play an input parametric data role. A quasi-analytic dynamic solution for the error fields are to be delivered. The solution will provide a clear dynamic behavior of the error fields amplitude for various discharges in tokamak devices. We believe that the above mentioned validated *direct* model perturbations results considered as a benchmark starting point for our error field derivation together with a subsequent correct mathematical calculus *inverse* approach will provide reliable results for the magnetic error fields dynamics.

References

[1] I.G. Miron and JET Contributors, Nucl. Fusion 61 (2021) 106016.

*See the author list of "Overview of JET results for optimising ITER operation" Joelle Mailloux et al. 2022 Nucl. Fusion